GRAIN-FREE POLYCRYSTALLINE SILICON AND METHOD FOR SAME

ABSTRACT OF THE INVENTION

A polycrystalline silicon film with quasi-single crystal silicon in a selected region and a method for fabricating the polycrystalline silicon film are provided. The method comprises forming a film of amorphous silicon and using a 2N-shot process to form polycrystalline silicon in an area of the film. For 2N-shot process iterations, a laser beam is projected through aperture patterns to anneal the area. The laser forms two orthogonal groups of laser beamlets, causing two orthogonal groups of grain boundary to form in the area. The spacing within the groups is in a range of 0.1 microns (μm) to 100 μm. A directional solidification (DS) process projects a laser through an aperture pattern to sequentially anneal a portion of the area in a selected direction. The DS process smoothes grain boundary ridges and selectively removes grain boundaries.